

WHAT IS CLAIMED IS:

- 1 1. A method of sensing temperature comprising:
2 providing a temperature sensor including a matrix on a surface of a substrate, the
3 matrix comprising a semiconductor nanocrystal in a binder;
4 irradiating a portion of the sensor with an excitation wavelength of light;
5 detecting emission of light from the sensor; and
6 determining the temperature from the emission of light from the sensor.

- 1 2. The method of claim 1, wherein the semiconductive nanocrystal includes a group
2 II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.

- 1 3. The method of claim 1, wherein the semiconductor nanocrystal is ZnS, ZnSe,
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,
3 InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.

- 1 4. The method of claim 1, wherein the semiconductor nanocrystal is overcoated with
2 a second semiconductor material.

- 1 5. The method of claim 1, wherein the semiconductor nanocrystal includes an
2 organic or organometallic overlayer, the overlayer making the nanocrystal soluble in the
3 binder.

- 1 6. The method of claim 5, wherein the overlayer includes a hydrolyzable moiety.

- 1 7. The method of claim 6, wherein the hydrolyzable moiety includes a metal
2 alkoxide.

- 1 8. The method of claim 1, wherein the binder includes an organic polymer.

- 1 9. The method of claim 1, wherein the binder includes an inorganic matrix.

1 10. The method of claim 1, wherein the nanocrystal is a member of a substantially
2 monodisperse core population.

1 11. The method of claim 1, wherein the population emits light in a spectral range of
2 no greater than about 75 nm full width at half max (FWHM).

1 12. The method of claim 1, wherein the population exhibits less than a 15% rms
2 deviation in diameter of the nanocrystal.

1 13. The method of claim 1, wherein the nanocrystal photoluminesces with a quantum
2 efficiency of at least 10%.

1 14. The method of claim 1, wherein the nanocrystal has a particle size in the range of
2 about 15 Å to about 125 Å.

1 15. A temperature sensor comprising a matrix containing a semiconductor
2 nanocrystal, the matrix formed from a semiconductor nanocrystal and a binder.

1 16. The sensor of claim 15, wherein the semiconductive nanocrystal includes a group
2 II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.

1 17. The sensor of claim 15, wherein the semiconductor nanocrystal is ZnS, ZnSe,
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,
3 InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.

1 18. The sensor of claim 15, wherein the semiconductor nanocrystal is overcoated
2 with a second semiconductor material.

1 19. The sensor of claim 15, wherein the semiconductor nanocrystal includes an
2 organic or organometallic overlayer, the overlayer making the nanocrystal soluble in the
3 binder.

- 1 20. The sensor of claim 15, wherein the overlayer includes a metal alkoxide.
- 1 21. The sensor of claim 15, wherein the matrix includes an organic polymer.
- 1 22. The sensor of claim 15, wherein the matrix includes an inorganic matrix.
- 1 23. The sensor of claim 15, wherein the nanocrystal is a member of a substantially
2 monodisperse core population.
- 1 24. A temperature-sensing coating comprising a matrix on a surface of a substrate,
2 the matrix comprising a semiconductor nanocrystal in a binder.
- 1 25. The coating of claim 24, wherein the semiconductive nanocrystal includes a
2 group II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.
- 1 26. The coating of claim 24, wherein the semiconductor nanocrystal is ZnS, ZnSe,
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,
3 InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.
- 1 27. The coating of claim 24, wherein the semiconductor nanocrystal is overcoated
2 with a second semiconductor material.
- 1 28. The coating of claim 24, wherein the semiconductor nanocrystal includes an
2 organic or organometallic overlayer, the overlayer making the nanocrystal soluble in the
3 binder.
- 1 29. The coating of claim 24, wherein the matrix includes an organic polymer.
- 1 30. The coating of claim 24, wherein the matrix includes an inorganic matrix.
- 1 31. The coating of claim 24, wherein the nanocrystal is a member of a substantially
2 monodisperse core population.

1 32. A temperature-sensing paint comprising a semiconductor nanocrystal in a binder
2 and a deposition solvent.

1 33. The paint of claim 32, wherein the semiconductor nanocrystal emits light
2 independent of oxygen pressure and dependent upon temperature upon irradiation by an
3 excitation wavelength of light.

1 34. The paint of claim 32, further comprising a pressure-sensitive composition, the
2 pressure-sensitive composition emitting light dependent upon oxygen pressure upon
3 irradiation by an excitation wavelength of light.

1 35. The paint of claim 32, wherein the pressure-sensitive composition includes a
2 porphyrin.

1 36. The paint of claim 32, wherein the porphyrin is a platinum porphyrin.

1 37. The paint of claim 32, wherein the binder includes an organic polymer.

1 38. The paint of claim 32, wherein the binder forms an inorganic matrix.

1 39. The paint of claim 32, wherein the deposition solvent includes an alcohol.

1 40. The paint of claim 32, wherein the semiconductive nanocrystal includes a group
2 II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.

1 41. The paint of claim 32, wherein the semiconductor nanocrystal is ZnS, ZnSe,
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,
3 InN, InP, InAs, InSb, TlN, TlP, TlAs, TlSb or mixtures thereof.

1 42. The paint of claim 32, wherein the nanocrystal is a member of a substantially
2 monodisperse core population.

1 43. A method of manufacturing a temperature-sensing paint comprising combining a
2 semiconductor nanocrystal, a binder, and a deposition solvent to form a paint.

1 44. The method of claim 43, further comprising preparing the semiconductor
2 nanocrystal by contacting an M donor, M being Cd, Zn, Mg, Hg, Al, Ga, In, or Tl, with an X
3 donor, X being O, S, Se, Te, N, P, As, or Sb to form a mixture; and heating the mixture to
4 form the nanocrystal.

1 45. A method of manufacturing a temperature sensor, comprising:
2 depositing a temperature-sensing paint on a surface of a substrate, the temperature-
3 sensing paint comprising a semiconductor nanocrystal in a binder, and a deposition solvent.

1 46. The method of claim 45, wherein the semiconductive nanocrystal includes a
2 group II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.

1 47. The method of claim 45, wherein the semiconductor nanocrystal is ZnS, ZnSe,
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,
3 InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.

1 48. A method of sensing temperature comprising:
2 providing a temperature sensor including a matrix on a surface of a substrate, the
3 matrix comprising a semiconductor nanocrystal in a binder, the semiconductor nanocrystal
4 including ZnS, ZnSe, ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb,
5 GaN, GaP, GaAs, GaSb, InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof
6 overcoated with a second semiconductor material and having an organic or organometallic
7 overlayer, the overlayer making the nanocrystal soluble in the binder, the overlayer including
8 a hydrolyzable moiety or a polymerizable moiety, the nanocrystal being a member of a
9 substantially monodisperse core population;
10 irradiating a portion of the sensor with an excitation wavelength of light;
11 detecting emission of light from the sensor; and
12 determining the temperature from the emission of light from the sensor.